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AN ACCOUNT OF THE PROGRESS
IN
CHEMISTRY
IN
THE YEAR 1882.

BY

PROF. H. CARRINGTON BOLTON.

FROM THE SMITHSONIAN REPORT FOR 1882.

WASHINGTON:
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CHEMISTRY.

By H. Carrington Bolton, Ph. D.,
Professor of Chemistry in Trinity College, Hartford, Conn.

The year 1882 is marked by great industry in all departments of chemistry; no startling announcements have been made, but several extremely interesting syntheses of organic bodies have been accomplished, viz, tyrosine and uric acid, both of the animal organism. Great activity is noted in the revision of the atomic weights. Progress has been made in unraveling the knotty problem of the rare earths in cerite, samarskite, and gadolinite, but no satisfactory conclusions have been reached as to the existence of the larger number of elementary bodies announced since 1877.

In the brief space at our disposal we can barely note the salient features of the year's work in a series of short abstracts, and these we confine chiefly to pure chemistry, paying little attention to analytical and industrial chemistry. Periodical literature, devoted exclusively to chemistry and its applications, is becoming voluminous; the fifteen principal journals of America, England, France, and Germany publish annually about 18,000 pages; in this rough estimate journals of physics and transactions of societies are not included, and both classes of serials contain much chemical material. We need hardly say that no attempt is made in the following pages to chronicle the prodigious amount and variety of work contained in these and other sources of information.

INORGANIC CHEMISTRY.

On the Reciprocal Solutions of Liquids.—Wladimir Alexejeff has devoted eight years to a study of the mutual solutions of mixed liquids, and he finds that the hypothesis proposed by Dossios is subject to exceptions. The latter stated that the mutual solubility of liquids increases with the rise in temperature, but Alexejeff finds that in certain bodies (isobutyl alcohol, for example) the solubility diminishes with an increase of temperature. He also discovers that the solubility decreases to a definite point and then increases again, or, in other words, that a *minimum* of solubility exists, just as certain solids have a maximum of solubility.

When phenol and water are brought together two layers form; the lower is a solution of phenol in water, the upper a solution of water in phenol. Now the mutual solubility of these liquids increases with the temperature, and at a certain point (68° for *pure* phenol) the two liquids mix in all proportions. Many liquids, such as aniline and water, follow the same law; solids, too, obey the same law, as is shown by the mutual action of water and salicylic acid. The author claims that the solutions of solid and of liquid salicylic acid exhibit a true physical isomerism. (*Bull. Soc. Chim.*, XXXVIII, p. 145.)

Molecular Structure and Physical Properties.—That a close connection exists between the structure of molecules and the physical properties of the substances composed of these molecules is becoming more and more evident. Pawlewski finds that the "critical temperatures" of isomeric ethers are very nearly identical, and that isomers containing doubly-linked atoms of carbon have a higher critical temperature than those in the molecules of which the carbon atoms are singly linked. (*Berichte d. chem. Ges.*, XV, p. 460.)

Determination of Gas Densities.—H. Goldschmidt and Victor Meyer have devised a simple method for determining gas densities in an expeditious manner. The process was employed at first in connection with experiments made on the density of cyanogen at various temperatures, but is applicable to many bodies. The vessel employed is first filled with pure, dry air of the temperature at which the density is to be taken; the air is then displaced by hydrochloric acid gas (free from air), collected over water and measured. The hydrochloric acid gas is in turn replaced by air. The gas to be examined is then introduced until all the air is expelled, and this gas is again displaced by hydrogen, or by air, and collected in a potash bulb containing a liquid capable of completely absorbing it. The increase in weight of the potash bulb gives the weight of the gas; the weight of an equal volume of air at the same temperature is determined from the volume collected, and the quotient gives the density sought.

The apparatus consists of a glass cylinder 200^{mm} long, 30^{mm} in diameter, with a capillary tube at each end, the extremities of which tubes rise above the upper end of the cylinder and are bent at right angles. This apparatus is heated in a glass tube with a bulbous extremity 400^{mm} long, and of sufficient size to contain the liquid, whose boiling point is the temperature of measurement. The liquids used in the outer vessel are water, aniline, amyl benzoate, and diphenylamine. For higher temperatures boiling sulphur and penta-sulphide of phosphorus are used, in which case the inner vessel receives a spherical form, and the outer vessel is made of iron.

The authors obtained by this process a density of 1.53 for carbonic anhydride, and of 1.26 for hydrochloric acid gas, figures exactly equal to the theoretical values.

The apparatus can also be employed as an air thermometer. Sulphur was found to boil at 426° C. (*Berichte d. chem. Ges.*, XV, p. 137.)

Chemical Reactions in the Leclanché Cell.—Dr. Edward Divers has presented the following reactions: Zinc is slowly acted upon by a solution of ammonium chloride, and crystals of zinco-diammonium-chloride are formed; this is decomposed by water alone into an insoluble and a soluble portion, probably as shown in this equation:

$$3Zn\,(NH_3\,Cl)_2 + 2\,OH_2 = 2\ HO\ Zn\,NH_3\,Cl + (Cl\,H_4\,N)_2.\ Zn\,(NH_3\,Cl)_2$$

Zinco-diammonium-chloride dissolved in solution of ammonium chloride acts gradually on artificially prepared hydrogen manganite, $H_2\,O_4\,Mn_2$, causing manganese to go into solution, and the precipitation of zinc on the manganite, probably thus:

$$(NH_3\,Cl)_2\,Zn + H_2\,O_4Mn_2 = 2\,NH_4\,Cl + Zn\,O_4\,Mn_2$$

These experimental facts lead the author to the following theory of the action of the cell:

Primary action:—Formation of hydrogen manganite and zinco-diammonium-chloride.

$$\overset{-}{Mn_2\,O_4} + 2\,HNH_3\,Cl + \overset{+}{Zn}$$

become $$Mn_2\,O_4\,H_2 + (NH_3\,Cl)_2\,Zn.$$

Secondary actions, causing polarization.—The hydrogen manganite acts locally upon the zinco-diammonium-chloride solution, and forms zinc manganite and ammonium chloride; this proceeds more rapidly by galvanic action when the cell is at work, thus:

$$\overset{-}{Mn_2\,O_4} + Zn\,(NH_3\,Cl)_2 + \overset{+}{Zn}$$

become $$Mn_2\,O_4\,Zn\,(NH_3\,Cl)_2\,Zn.$$

The zinc manganite and the hydrogen manganite by coating over the manganese dioxide, protect it from the primary action of the ammonium chloride and zinc, and thus cause polarization of the cell.

Secondary actions, causing depolarization.—The ammonium chloride dissolves manganous and zinc oxides out of the manganite, the manganous oxide liberating ammonia:

$$Mn_2\,O_4\,Zn + 4\,Cl\,H_4\,N = Mn\ O_2 + 2\,OH_2 + Cl_2\ Mn + (NH_3\,Cl)_2\,Zn + 2NH_3.$$

The manganous chloride dissolves in the presence of the free ammonia as a double chloride of manganese and ammonium. By the solution of these oxides the manganese dioxide of the manganite becomes active again. The depolarizing action proceeds slower than the polarizing, and therefore the battery requires to be left uncircuited, in order to recover its full power after use. (*Chem. News*, XLVI, p. 259.)

Atomic Weights of the Elements.

Carbon.—Roscoe has redetermined the atomic weight of carbon by the direct combustion of the diamond. If O = 15.96, he obtained as a mean of six experiments C = 11.9757. Dumas and Stas in 1840 obtained 11.9708. (*Comptes Rendus*, CIV, p. 1180.)

Uranium.—Zimmermann has prepared metallic uranium by Péligot's method and studied its properties. Its specific gravity is 18.685, and its specific heat between 99° and 0° is .02765; the latter number multiplied by 240 gives a product of 6.64, which agrees with the mean atomic heat indicated by Dulong and Petit's law. This settles the controversy concerning the correct value in favor of 240 and in accordance with Mendelejeff's classification. (*Berichte d. chem. Ges.*, XV, p. 847.)

Glucinum.—Dr. James Blake thinks that the evidence derived from the physiological action of the salts of glucinum may be of use in determining its true position among the elements. He finds that the effects produced by the introduction into the blood of salts of Be are the same as those caused by the salts of alumina and of ferric oxide. He regards glucinum as a member of the aluminium group of metals. (*Chem. News*, XLV, p. 111.)

Aluminium.—The atomic weight of this element has been subjected to a painstaking revision by Prof. J. W. Mallet. The general mean of 30 experiments gives Al = 27.032, with a probable error of ± 0.0045. [Oxygen = 15.961.] (*Chem. News*, XLV, pp. 256 *et seq.*)

Rubidium.—Charles T. Heycock has redetermined the atomic weight of rubidium with the view of testing its relation to Prout's hypothesis. The figures obtained by titration of the chlorine in pure chloride of rubidium are 85.344; and those by titration of the bromide are 85.387, results which lead the author to the conclusion that at present rubidium cannot be regarded as conforming to Prout's hypothesis. (*Report of British Assoc.*, in *Nature*, XXVI, p. 467.)

Didymium.—Brauner has determined the atomic weight of didymium as 146.18, and that of lanthanum as 138.88. (*J. Chem. Soc.*, XLI, p. 68.)

Yttrium has been prepared by Cleve free from terbium and its atomic weight redetermined. He assigns the value 88.9 to Y''' when O = 15.9633. (*Comptes Rendus*, December 11, 1882.)

Thorium.—L. F. Nilson has redetermined the atomic weight of thorium by ignition of the carefully purified sulphate: $Th(SO_4)_2.9H_2O$, and obtains as a mean of ten experiments 232.40. (*Berichte d. chem. Ges.*, XV, p. 2519.)

A recalculation of the atomic weights, by Prof. E. W. Clarke.—Brief mention must be made in this connection of the systematic recalculation of the atomic weights carried out by Professor Clarke and published by the Smithsonian Institution as Part V, of the Constants of Nature. Chemists are under great obligations for this invaluable treatise.

Composition of the Atmosphere.

Several chemists have carried on independently more or less elaborate researches on this subject. Reiset has made numerous determinations of the amount of carbonic anhydride in the atmosphere, and finds the values usually given (4 to 6 volumes in 10,000) much too high. He gives 2,962 vols. in 10,000 as the mean of 220 experiments made near Dieppe. The ratios obtained in Paris are somewhat higher, being 3,168 vols. of carbonic anhydride in 10,000 of air. (*Ann. Chim. et Phys.* (5) XXVI, pp. 245 *et seq.*)

A. Muntz and E. Aubin have also made determinations of the proportions of carbonic anhydride in the atmosphere at Paris and near Vincennes, and the results (which confirm Reiset's figures) show that the variations in the amount of carbonic anhydride are due to local influences, and that in general the heavier gas is quite uniformly distributed throughout the lower strata of the atmosphere. These chemists also examined the air of elevated regions, conducting experiments at the altitude of 2,877 meters (9,422 feet) in the Pyrenees. Although the direction of the wind and state of the atmosphere varied greatly during their experiments, the proportion of carbonic anhydride was found to be constant, being about 2.86 vols. in 10,000 of air. For the sake of comparison the air was examined in two valleys at the foot of the Pyrenees, one near Pierrefitte (507 meters above the sea-level) and the other near Luz (730 meters); at the first station the air was found to contain 2.79 vols. of carbonic anhydride in 10,000, and at the second 2.69 in 10,000, the latter determination being made in the midst of luxurious vegetation. Muntz and Aubin conclude that carbonic anhydride is very uniformly distributed throughout the atmosphere, and regard their results as confirming Reiset's statements and Schloesing's theories concerning the circulation of carbonic anhydride upon the surface of the earth. (*Comptes Rendus*, XCIII, p. 797.)

Dr. Edward W. Morley has devised a method for accurate and rapid analyses of air, and has made a series of daily analyses in duplicate of air collected at Hudson, Ohio, for six months, beginning with January 1, 1880, and one for six months and twenty days, beginning October 1, 1880. For details of the apparatus and process we refer to the original paper. Each pair of analyses occupied about 70 minutes of time, and the mean error of a single analysis for half a month was less than the thousandth part of one per cent. By comparing the results of this long series of daily determinations with the data obtained from the thrice-daily maps of the state of the weather furnished by the United States Signal Service Bureau, Dr. Morley finds that most of the variations in the amount of oxygen are caused by the vertical descent of air from high elevations. This descent of cold air seems to be the effect of sudden and severe depressions of temperature rather than the cause; the descent follows the cold by a day or two, and the decrease in amount of oxygen begins simultaneously with the descent from above. (*Proc. Am. Assoc. Adv. Sci.*, 1881; abstract in *Chem. News*, XL, pp. 245, 284 *et seq.*)

List of New Elements announced since 1877.

The six years ending in 1882 have been unusually prolific in new elements, or at least in announcements of the same, for it must be conceded that most of them will fail to stand the test of more thorough investigation. These alleged discoveries are widely scattered in periodical literature, and the following list may prove useful for reference:

List of elementary substances announced from 1877 *to* 1882.

Date.	Name.	Source.	Discoverer.
1877	Neptunium	Columbite	Hermann.
	Lavoesium	Pyrite	Prat.
	Mosandrum	Samarskite	J. L. Smith.
	Davyum	Platinum ores	Sergius Kern.
1878	"New earths"	Unnamed mineral	Gerland.
	"X"	Gadolinite	Soret.
	Philippium	Samarskite	Delafontaine.
	Decipium	Samarskite	Delafontaine.
	Ytterbium	Gadolinite	Marignac.
1879	Scandium	Gadolinite	Nilson.
	Norwegium	Gersdorffita	Dahll.
	Uralium	Platinum	Guyard.
	Samarium	Samarskite	Lecoq de Boisbaudran.
	Barcenium	(Misapprehension)	Wagner's Jahresbericht.
	Thulium	Gadolinite	Cleve.
	Holmium	Gadolinite	Cleve.
	Columbium	Samarskite	J. L. Smith.
	Rogerium	Samarskite	J. L. Smith.
	Vesbium	Lava	Scacchi.
1880	Comesium		Kaemmerer.
	$Y\alpha$ and $Y\beta$	Gadolinite	Marignac.
1881	Actinium	Zinc ores	Phipson.
1882	Didymiumβ	Gadolinite	Cleve.

New Elementary Substances.—At the meeting of the Russian Chemical Society held October 20, 1881 (and reported in the *Bulletin de la Société Chimique de Paris*, for August, 1882), Mendelejeff, the distinguished author of the periodic law, remarked that only two of the recently announced elements—scandium and ytterbium—had been satisfactorily confirmed. These have been obtained in a pure state by Nilson, and neither of them has absorption spectra. All the other metals seem to be mixtures, as was the case with the old erbium of Bunsen and Bahr, and which proves to contain Sc, Yb, Er, Tr, and other elements. Scandium corresponds in its atomic weight and properties to *ekabor*, a hypothetical substance, the existence of which had been foreseen by the speaker.

Mendelejeff expressed himself convinced that his periodic law will find further confirmation in the results to be yet obtained in studying the elements of cerite and of gadolinite. (*Bull. Soc. Chim.*, XXXVIII, p. 140.)

A new element accompanying didymium is announced by the Swedish chemist, Prof. P. T. Cleve. He has long studied the rare earths existing in cerite, gadolinite, and similar minerals, and the behavior of the oxide of didymium obtained from the latter has led him to suspect the presence of a new element. In the beginning of the year 1882 he submitted to fractional precipitations about 200 grams of didymium oxide, and separated from the yttria earths with potassium sulphate by repeated precipitations; the atomic weight of the first fraction was 146, that of the last 142. The examination of the ignition spectrum of the last fraction showed, besides strong rays of didymium and lanthanum, new rays, among which is a very strong one having the wave-length of 4333.5. This ray belongs neither to didymium, lanthanum, yttrium, erbium, terbium, nor to Marignac's *Yα*, and is regarded by Cleve as peculiar to a new element which he designates provisionally by *Diβ*. (*Comptes Rendus;* abstract in *Chem. News*, XLV, p. 273.)

Soon after the publication of the above statement by Professor Cleve, B. Brauner printed a note in the *Chemical News* (46, 16), in which he shows that he anticipated the Swedish chemist in discovering a new element accompanying didymium in cerite. His experiments were made in Professor Roscoe's laboratory, and some of his results were published in the *Anzeiger der kais. Academie der Wissenschaften* (October 6, 1881). Brauner thinks that oxide of didymium, as usually known to chemists, consists of a mixture of at least three elements, true didymium having an atomic weight =145.4, Cleve's element, more basic than didymium, and a third with a higher atomic weight is less basic than didymium. This last may possibly be samarium.

Professor Cleve in a still later communication states that continued researches by himself and Thalèn have convinced him that the ray 4333.5 belongs to the spectrum of lanthanum, and that the existence of a new element is very improbable. (*Chem. News*, XLVI, p. 43.)

The earths contained in samarskite have been studied by Professor H. E. Roscoe, with the object of ascertaining the existence or non-existence of Delafontaine's philippium. Roscoe worked up 1,500 grams of samarskite and obtained about 60 grams of oxides containing terbium, erbium, yttrium, and philippium (?). The oxides were converted into formiates, and these salts carefully examined to obtain pure philippium salt, but the author failed to get an oxide having a constant atomic weight equal to 122 (claimed by Delafontaine). The numbers varied between the atomic weights of terbia and yttria. Roscoe then tried the following conclusive experiment: 3 grams of terbia, having an atomic weight of 147.9, and 3 grams of crude yttria, with an atomic weight of 101.4, were respectively converted into formiates. Of each of these two formiates, two-thirds were brought into solution separately while the other third of the terbium formiate was mixed with the remaining third of yttrium formiate, and the mixture dissolved. Each of the three solutions was then mixed with an equal bulk of alcohol and allowed to stand for the same length of time. The two solutions, containing respectively terbia and yttria, gave crystals presenting the ordinary appearance of formiates of the metals in question, but the third solution containing the mixed formiates deposited rhombic prisms exactly like the crystals which Delafontaine claims are peculiar to the formiate of philippium. The non-existence of philippium is thus undoubtedly established. (*Chem. News*, XLV, p. 184.)

Researches on other Elements, etc.

Thorium.—Two important memoirs have been published by L. F. Nilson on thorite and its chief constituent, thorium. He worked upon two kilograms of the rare mineral and prepared a very pure thorium sulphate, from which he made a determination of the atomic weight of the element. (*See* paragraph on atomic weights.) He determined the specific gravity of thoria, finding the figures 10.2199. He also prepared the metal by the reduction of potassio-thorium chloride with sodium in the iron apparatus he had previously used for beryllium. The metal obtained formed a gray shining powder showing distinct crystals under the microscope; it is unaltered by exposure to air up to 100–120° C.; when heated higher it burns brilliantly, forming a snow-white oxide. The metal burns in chlorine, bromine, and iodine gases, yielding sublimates; it is slowly attacked by dilute sulphuric acid, and by dilute nitric; concentrated nitric acid has very little effect. Hydrochloric acid dissolves the metal readily. The metal has the specific gravity of about 11, results being not perfectly satisfactory. (*Berichte d. chem. Ges.*, XV, pp. 2519–2547.)

Properties of Pure Metallic Aluminium.—Prof. J. W. Mallet, in the course of his researches on the atomic weight of this metal, required a quantity in a very pure condition, and this gave an opportunity of studying its properties. Crude (commercial) aluminium contains:

Al	96.89
Fe	1.84
Cu	trace.
Si	1.27
	100.00

This was converted into bromide by treatment with liquid bromine, and the product purified by fractional distillation. It was then reduced by sodium in a crucible lined with a mixture of purified and dried alumina, with sodium aluminate. The metallic globules were again fused and further purified with hydrochloric acid. The metal thus obtained was perceptibly whiter than the commercial article, also softer, more malleable, and had a fracture with some appearance of fibrous silkiness. Its specific gravity at 4° C. is 2.583. Its specific heat is 0.2253 as a mean for the range of temperature 0°–100° C. Attempts were made to roughly estimate the fusibility, and the pure metal seems to be a little less fusible than the commercial article. It also presents greater resistance to the prolonged action of solvents—acids and alkalies—than the impure metal. (*Chem. News*, XLVI, p. 178.)

Iridium, according to Mr. John Holland, can be alloyed with phosphorus at a high heat, and the alloy fuses at a comparatively low temperature. The fused metal contains, according to Prof. F. W. Clarke, about 7½ per cent. of phosphorus. The phosphorus is removed by heating in a Hessian crucible with lime. The iridium melted by this process is compact and crystalline; it is harder than the natural metal, being nearly as hard as the ruby; it has the color of steel and is not attacked by acids. (*Che.. . News*, XLV, p. 168.)

Preparation and Properties of Metallic Cæsium.—Owing partly to the extreme scarcity of material Bunsen's attempts to obtain cæsium in metallic form were unsuccessful, but Carl Setterberg, availing himself of the tons of alums obtained in Marquart's establishment as a secondary product in the manufacture of lithium compounds from lepidolite, has isolated this rare metal and studied its properties. Setterberg prepared in 14 days 40 kilograms of rubidium alum and 10 kilograms of cæsium. He obtained metallic rubidium by decomposing the hydrogen-tartrate with calcium carbonate and sugar, in a mercury flask, but attempts to prepare cæsium by a similar process were futile. By the electrolysis of the cyanide of cæsium mixed with barium cyanide in the ratio of 4 molecules to one, Setterberg obtained the metal quite free from impurities. Metallic cæsium resembles closely the other alkali metals; is silver white, malleable, and very soft at ordinary tem peratures. Thrown upon water it floats around and decomposes it with evolution of heat and light, in the same manner as potassium and rubidium. It inflames easily when exposed to the air unless protected by a film of oxide or by a layer of petroleum. The metal melts between 26° C. and 27° C.; its specific gravity is 1.88 at 15° C. Examined in the spectroscope it showed only traces of sodium as an impurity.

Setterberg failed to detect new elementary substances in the residues from which he extracted the rubidium and cæsium salts. (*Liebig's Annalen*, CCXI, p. 100.)

Nascent Hydrogen.—D. Tommasi, by numerous experiments on the reducing power of nascent hydrogen, has been led to the conclusion that its peculiar power varies with the reaction by which it is generated. Hence, hydrogen in a nascent state may be regarded as hydrogen + *calories;* or H + α, in which α has different values according to the source of the hydrogen; thus:

$$SO_4H_2 + Zn + aq; \quad \alpha = 38 \text{ cal.}$$
$$SO_4H_2 + Cd + aq; \quad \alpha = 23.8 \text{ cal.}$$
$$SO_4H_2 + Mg + aq; \quad \alpha = 112 \text{ cal.}$$

The hydrogen increases in activity with the increase in value of α; for sodium amalgam it is 112 cal. (*Bull. Soc. Chim.*, XXXVIII, p. 150.)

Preparation of pure Nitrogen.—Attempts to remove the last traces of oxygen from atmospheric air by means of phosphorus, potassium pyrogallate, hyposulphites, potassiumsodium alloy, and red-hot copper proving unavailing, Dr. Walter Flight found that it can be effected by passing the gas over a large surface of freshly precipitated ferrous hydrate. The latter reagent he prepares by adding a strong solution of 80 grams of caustic potash to one of 200 grams of ferrous sulphate. The nitrogen thus treated failed to develop a brown color with apotssium pyrogallate. (*Chem. News*, XLV, p. 105.)

Behavior of Nitrogen in the Distillation of Coal.—Text-books usually state that coal contains about 2 per cent. of nitrogen, which comes off as ammonia when the coal is heated in closed vessels. Prof. W. Foster, however, finds that only a small fraction of the total nitrogen comes off as ammonia. In an experiment with coal containing 1.73 per cent. of nitrogen, only 14.5 per cent. of this amount was evolved as ammonia, 1.56 per cent. as cyanogen, 35.26 remained unaltered, and 48.68 of the whole amount remained in the coke. (*Chem. News*, XLV, p. 299.)

Presence of Arsenic in Bismuth Subnitrate.—Of fourteen samples of bismuth subnitrate examined by R. H. Chittenden and S. W. Lambert, only one was found to be perfectly free from arsenic. The average content of poison in the samples was .013 per cent. or 13 mgms. (about two-tenths of a grain) of $As_2 O_3$ in 100 grams of bismuth. The subnitrate of bismuth is extensively used in medicine, and though it may not contain arsenic in sufficient quantity to be in itself injurious, the presence of the poison is greatly to be deplored. Fortunately, as the further experiments of the authors show, the arsenic is not readily absorbed into the system when combined with the bismuth preparation. (*Am. Chem. J.*, III, p. 396.)

A new Oxichloride of Sulphur.—J. Ogier, by heating to 250° C. in sealed tubes a mixture of equal weights of chloride of sulphur and chloride of sulphuryle, obtained the body $S_2 OCl_2$; it forms a dark red liquid, boiling at 60° and having a specific gravity at 0° of 1.656. Its formation is explained by the equation:

$$2 S_2 Cl + 2 SO_2 Cl = 2 S_2 OCl_2 + SO_2 + S$$

It is decomposed by water, forming a precipitate of sulphur, sulphurous anhydride, sluphuric acid, hydrochloric acid, and thio-acids. (*Bull. Soc. Chim.*, XXXVII, p. 293.)

An abundant source of selenium, according to P. Kienlen, exists in the crude hydrochloric acid condensed in Glover's towers. The selenium is derived from the pyrites, and being volatile at a red heat is carried over by the hydrochloric acid gas during the calcination of the salt cake, and condenses in the first recipients in the form of a reddish mud; this mud, when dried, contains in some cases from 41 to 45 per cent. of selenium. The author extracts the selenium from this deposit by acting upon it with chlorine, which converts it into a tetrachloride, and this, in the presence of water and chlorine, is transformed into selenic acid. The acid liquid obtained is then precipitated with hydrogen sodium sulphite andpurified. (*Bull. Soc. Chm.*, XXXVII, p. 441.

Presence of Tellurium in Copper.—Prof. Th. Egleston has detected tellurium in commercial copper to the extent of about 0.1 per cent. A surprisingly small quantity renders the copper red-short, and consequently worthless for rolling. (*Trans. Am. Inst. Mining Engineers*, Harrisburg Meeting, Oct., 1882.)

Complex inorganic Acids.—Dr. Wolcott Gibbs has published a continuation of his remarkable researches on the complex inorganic acids. He has demonstrated that inorganic compounds possess an unexpected degree of complexity, and has entered a very wide field of research, yielding a rich harvest. After discussing in detail several phospho-molybdates, he describes the preparation of the arsenio-molybdate having the composition:

$$16\ MoO_3.\ As_2O_5.\ 5\ (NH_4)_2\ O.\ H_2O + 8\ aq.$$

The study of these two series (phospho- and arsenio-molybdates) leads to the following general results:

1. The phospho-molybdates form a series of which the lowest term contains five atoms of molybdic to one of phosphoric oxide, and the highest twenty-four atoms of the former to one of the latter.

2. As in the case of the phospho-tungstates, the greater number of the molybdenum compounds contain an even number of atoms of tungstic acid. The homologizing term is, therefore, $2\ MoO_3$ for these cases.

3. By far the greater number of phospho-molybdates contain *three* atoms of fixed base (old style), or, in more modern language, may be considered as derived from acids containing *six* atoms of hydroxyl. Anhydrous compounds of this type occur, and are not always simply residues obtained by heating salts which may be considered as acid, as containing, for example, $3\ R_2O.\ 3\ H_2O$. It seems, therefore, necessary to admit the existence of acide of the general type $n\ MoO_3.\ P_2O_5.\ 3\ H_2O$.

4. On the other hand, while no single phospho-molybdate containing more than three atoms of fixed base for one of phosphoric oxide has been obtained in a state of indubitable purity, there is probably at least one salt with *six* or more atoms of fixed base, viz:

$$22\ MoO_3.\ P_2O_5.\ 7\ Ag_2O + 14\ aq.$$

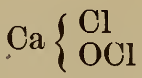
5. Negative evidence concerning the probable non-existence of a series of phospho- or arsenio-molybdates containing more than *three* atoms of fixed base, must not be too highly regarded.

6. As in the case of the phospho-tungstates, there exists a class of phospho-molybdates in which the ratio of the number of atoms of base to that of the number of atoms of phosphoric oxide is as 5 : 2, the number of atoms of molybdic oxide being even.

Dr. Gibbs presents a series of structural formulæ which explain all degrees of basicity which appear to be possible under the general conditions of the problem. For these and other details we refer to his original paper. (*Am. Chem. J.*, III, p. 402.)

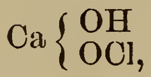
Constitution of Bleaching Powder.—Chemists have devoted much labor to the determination of the exact constitution of bleaching powder, and have arrived at results expressed in a great variety of formulæ.

Thorpe gives: $Ca^3H_6O_6Cl_4$ (= $CaCl_2O_2 + CaCl_2 + CaH_2O_2 + 2\,H_2O$); Rose gives: $(CaCl_2,Ca_2O_2)\ CaO_2Cl_2 + 4\ H_2O$; Kolb after a very thorough investigation: $(2\ CaO_1Cl_2H_2O),\ CaH_2O_2$. Odling proposed the formula



$$Ca\left\{\begin{matrix}Cl\\ OCl\end{matrix}\right.$$

and this view has been quite generally adopted. Stahlschmidt regards bleaching powder as calcium hydroxychloride,



$$Ca\left\{\begin{matrix}OH\\ OCl,\end{matrix}\right.$$

i. e., calcium hydroxide, CaH_2O_2 in which one atom of hydrogen is replaced by chlorine.

The question has been again investigated by Dr. Karl Kraut, who examined the action of chlorine on lithium hydroxide and obtained a compound very similar to the calcium analogue. When chlorine gas was brought in contact with the melted lithium hydroxide, the latter increased only 1 per cent. in weight in 4½ hours, but by the addition of crystallized lithia in such quantities that the mixture contained about 1.4 per cent. H_2O the action of the chlorine was hastened. The reaction is as follows:

$$4\ LiOH + 2\ Cl = LiCl + LiOCl + 2\ LiOH + H_2O$$

This equation was confirmed by analysis of the product. The lithium bleaching powder reacts with carbonic anhydride exactly like the calcium compound, *i. e.*, it is decomposed with liberation of chlorine. It also behaves with chlorine just like the calcium compound. Since, however, lithium is a mono-valent element, one atom of the metal cannot simultaneously bind chlorine and the radical of hypochlorous acid, and Odling's manner of representing the constitution of bleaching powder is inapplicable. Besides, the lithium bleaching powder contains lithium chloride ready formed. The author therefore concludes that bleaching powder is a mixture of calcium hypochlorite, calcium chloride, and calcium hydrate. (Liebig's *Annalen*, CCXIV, p. 354.)

Lead peroxide can be advantageously prepared, according to Fehrmann, by decomposing a concentrated solution of chloride of lead at 50° or 60° C. with a solution of bleaching powder. The latter is added until the filtrate no longer shows a brown color when tested with an additional quantity of the bleaching powder. The lead peroxide is well washed and collected on a filter. It is nearly black, and very pure. The acetate of lead does not yield such good results as the chloride. (*Berichte d. chem. Ges.*, XV, p. 1882.)

Determination of Organic Matter in Potable Water.

Prof. J. W. Mallet, in compliance with the instructions of the National Board of Health, has made a thorough investigation of the chemical methods in use for the determination of organic matter in the potable waters. Assisted by Mr. W. A. Noyes, Dr. Charles Smart, and Dr. J. A. Tanner, he examined the merits and demerits of the "combustion process," the "albuminoid-ammonia process," and the "permanganate process." The special conclusions as to the combustion process may be briefly stated: The combustion itself, carried out according to Frankland's directions, is a process of great delicacy and satisfactory in trained hands; it requires constant practice to secure good results; the defective point is the failure of the evaporation to leave a residue representing the original organic matter of the water, a loss in carbon and a gain in nitrogen being constant errors; the dissociation of ammonia salts during the evaporation occasions a loss of nitrogen; in the presence of nitrates the difficulties of combustion are great and as yet insuperable; finally, the combustion process cannot be considered as "determining" the carbon and nitrogen of the organic matter in water in a sense to justify the claim of "absolute" value for its results which has been denied to those of all other methods.

The special conclusions as to the albuminoid-ammonia process are as follows: In the determination of both "free" and "albuminoid" ammonia there is a loss resulting from imperfect condensation of the ammonia during distillation; when urea is present some ammonia is easily formed by boiling with sodium carbonate, and this vitiates the determination of "free" ammonia; in the distillation with alkaline permanganates the nitrogenous matter sometimes fails to be completely acted upon before the contents of the retort is nearly reduced to dryness, and great uncertainty results; the value of the results by this process depends more upon watching the *progress* and *rate* of evolution of the ammonia than upon determining its total amount.

The special conclusions as to the permanganate process are: The results obtained by the Tidy method, and by Kubel's modification of the same, differ irregularly, the latter usually giving much higher figures; the results obtained by the Tidy process are liable to variations with the atmospheric temperature prevailing at the time the process is applied; the amount of oxygen consumed cannot be taken as a measure either of the organic carbon or of the total organic matter, though a general resemblance may be traced between strongly marked results, high or low, for the consumption of oxygen on the one hand and inorganic carbon (by the combustion process) on the other; the process is capable of giving more valuable information by watching the *rate* and *progress* of the oxidation of organic matter present than by any single determination of the absolute amount of oxygen consumed in a given time. (*Am. Chem. J.*, IV, p. 341.)

Use of Quicklime in Blasting.

An interesting application of the force resulting from the expansion due to hydration is recorded in *Nature*. To obviate the danger attending the use of explosive substances in coal mines, the following process has been successfully employed in Derbyshire; A series of holes six feet apart and about three feet in depth are drilled into the coal at the proper points; these holes are then filled with cylinders of compressed quicklime, each 2½ inches in diameter and 4½ inches long; each hole receives seven of these blocks. A groove in each cylinder admits the insertion of a ½-inch pipe which extends a few inches beyond the aperture of the drilled hole; through this pipe water is forced by a small hand pump. Each hole is of course firmly tamped with paper and rubbish. Soon after the water is introduced a sound as of escaping steam is heard, here and there the tamping is blown out, and in a few minutes the whole mass of coal is thrown out from the face upon "sprags," short timber props placed to receive it. The time required in the various operations is as follows: drilling 12 minutes, charging 4 minutes, watering 2 minutes, total 17 minutes for each bore-hole. (*Nature*, XXVI, p. 298.)

ORGANIC CHEMISTRY.

Formaldehyde (or oxymethylene) has acquired great importance within a short period, the researches of Baeyer, Wurtz, and others having shown that it forms an intermediate product between carbonic acid and carbo-hydrates in the physiology of plant-life. It may be regarded as the first product of the assimilation of carbonic acid by plants, and by simple polymerization and elimination of water, is probably capable of producing sugar, glucose, starch, and cellulose.

B. Tollens has described a convenient method for preparing this substance, which is based upon the oxidation of methylalcohol by air and incandescent platinum. For details we refer to the original paper. (*Berichte d. chem. Ges.*, XV, p. 1629.)

Curcumin and other Substances from Turmeric.—C. Loring Jackson and A. E. Menke give the following: Bengal turmeric root is ground and treated in an extracter with ligroine to remove turmeric oil, and then the curcumin, mixed with a large quantity of resin, is extracted with ether and finally purified by crystallization from alcohol. The average yield of curcumin was 0.3 of one per cent. The mean of five analyses indicates the following composition:

Carbon	68.30
Hydrogen	5.63

Curcumin crystallizes from alcohol in stout needles often in radiating groups. It has an orange to yellow color with a blue reflex; its ether solution fluoresces green; it melts at 178° C. It is nearly insoluble in water, slightly in benzol, readily soluble in hot alcohol, and more readily soluble in glacial acetic acid; dissolved in strong sulphuric acid it blackens by charring; it is readily soluble in alkalies and alkaline carbonates. It forms two potassium salts $K_2 C_{14} H_{12} O_4$ and $K C_{14} H_{13} O_4$, as well as calcium, zinc and barium salts, the last named being insoluble. By a study of the esters of curcumin the authors definitely establish $C_{14} H_{14} O_4$ as the true formula. The results of incomplete oxidation are most interesting; by treating an aqueous alkaline solution with potassium permanganate, not in excess, a strong smell of vanilla was observed. Further treatment effected the separation of an oil, gradually solidifying in circular groups of radiating needles, and having a strong odor of vanilla. By sublimation and purification of this product, white needles of vanillin, melting at 78° C., were obtained. The yield was very small. The authors also show that diethylcurcumin yields by oxidation ethylvanillic acid. (*Am. Chem. Journ.*, IV, p. 77.)

Urea, its Synthesis and its Estimation.—Fenton has succeeded in transforming urea into cyanamide; the dehydration was effected by means of sodium in accordance with the reaction:

$$2\ CON_2 H_4 + 2\ Na = 2\ CN_2 H_2 + 2\ Na\,OH + H_2$$

Prof. W. G. Mixter has succeeded in forming urea by the reaction of ammonia on carbonic anhydride at a red heat. The urea forms slowly, 2 to 3 decigrams per hour, and collects in fine crystals in the cooler parts of the tube through which the gases are conducted. He regards the formation of urea, as preceded by that of cyanic acid, thus: $CO_2 + NH_3 = HCNO + H_2 O$. The cyanic acid probably unites with ammonia in the cooler part of the tube to form urea. (*Am. Chem. J.*, IV, p. 35.)

J. R. Duggan described a modification of Knop's process of estimating urea by the amount of nitrogen evolved on the addition of an alkaline hypobromite. His method consists in mixing the urea and caustic soda solutions first and then adding the bromine. He employs a caustic soda solution made by dissolving 20 grms. of sodium hydrate in 100 c. c. of water; and with each 20 c. c. of this he uses 1 c. c. of bromine. The results are satisfactory. The weight of nitrogen multiplied by 2.143 gives the amount of urea. (*Am. Chem. J.*, IV, p. 47.)

Dr. Theodore G. Wormly has also investigated the above method of determining urea and finds that only under the following conditions is the whole of the nitrogen uniformly set free: 1st. The reagent (hypobromite) should be freshly prepared; 2d. The urea solution should be wholly added to the reagent; 3d. The amount of urea operated upon should not exceed 1 part to about 1,200 parts of the diluted reagent; 4th. When comparatively large amounts of urea are present the surrounding temperature should not be less than about 20° C. (68° Fah.). (*Chem. News*, XLV, p. 27.)

Acrolein Urea.—Hugo Schiff has described under the name acryldiureide, a body resulting from the union of two molecules of urea and one of acroleine: Prof. A. R. Leeds has obtained a body having the same constitution, CO $(NH)_2$ C_3 H_4. It forms a white amorphous substance, slightly soluble in alcohol, ether, chloroform, and carbon-disulphide. Dr. Leeds points out some irrational conclusions in Schiff's paper, and accounts for them by presuming that Schiff operated upon imperfectly purified material. (*Berichte d. chem. Ges.*, xv, p. 1159.)

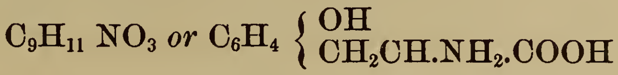
Synthesis of Uric Acid.—This interesting synthesis has been accomplished by Prof. Johann Horbaczewski. Pure, finely powdered glycocoll (made from hippuric acid) is mixed with ten parts of pure urea (made from ammonium cyanate) and heated in a flask to 200° to 230° C., until the material becomes brownish-yellow and viscous. After cooling the mass is dissolved in diluted potassium hydroxide, saturated with ammonium chloride, and precipitated with a mixture of ammoniacal silver nitrate and magnesia mixture. The precipitate, which contains the uric acid, is well washed with ammonia water and treated with potassium sulphide. The filtrate is then over-neutralized with hydrochloric acid and boiled down to a small bulk. The raw material thus obtained is purified by solution in potassium hydroxide, and after repeating the operation, the yellowish crystalline powder is washed with alchohol, dried with carbon disulphide (to remove the sulphur), and finally with ether. This purified material exhibits all the properties and reactions of uric acid. The author is engaged in a further study of this synthetical reaction. (*Berichte d. chem. Ges.* xv, p. 2678.)

Synthesis of a new Amido-Acid analogous to Hippuric Acid.—By the action of silver glycocollate on benzoylchloride, Th. Curtius has obtained three acids, ordinary hippuric acid, hippurylglycocoll, and a third of unknown constitution having the empirical formula $C_{10}H_{12}$ N_3O_4. The hippurylglycocoll or hippurylamidoacetic acid crystallizes from hot water in rhombic tables or needles which melt without decomposition at 206°.5 C. The new acid crystallizes in microscopic needles which become brown when heated to 230°, and are decomposed at 240° C. (*Journal prak. Chem. N. F.*, XXVI, p. 145.)

Synthesis of Tyrosine.—Tyrosine forms a crystalline nitrogenous body existing in the animal organism (spleen, liver, urine, &c.), produced by the decomposition of albuminoid substances. It has long been studied by chemists; Liebig obtained it by acting on decomposing caseine with melted potash, Müller found it in putrefying yeast, Hinterberger prepared it by boiling oxhorn with sulphuric acid, and its constitution has been discussed by several authors. In 1869 L. Barth pointed out that tyrosine could be regarded as a parahydroxyphenylamidopropionic acid, but his attempts to prepare it, as well as the proposed reactions of Beilstein and Kuhlberg, were unsuccessful.

Erlenmeyer has been engaged for several years in experimenting in this direction, and with the assistance of Dr. A. Lipp has at length accomplished this interesting synthesis. The process is as follows:

Phenylalanin (phenyl-α-amidopropionic acid) is converted into paranitrophenylalanin by the action of sulphuric and nitric acids, and this product is transformed into paraamidophenylalanin by means of tin and hydrochloric acid. The chloride of this diamido compound is treated in alcoholic solution with nitrous acid and the resulting body heated with water. On evaporating and treating the residue with ether a sirupy liquid is obtained which is probably parahydroxyphenyllactic acid. This product is supersaturated with ammonia and concentrated by evaporation, which gives a crystalline mass showing under the microscope the crystalline characters of tyrosine. By recrystallizing from dilute boiling alcohol the material is purified. Analysis shows it to have the exact constitution of tyrosine:



$$C_9H_{11}NO_3 \text{ or } C_6H_4 \begin{cases} OH \\ CH_2CH.NH_2.COOH \end{cases}$$

(*Berichte d. chem. Ges.*, XV, pp. 1006 and 1544.)

Synthesis of Anthracene and Phenanthrene from Orthobrombenzylbromide.—C. Loring Jackson and J. Fleming White, with a view to settling the exact constitution of anthracene, have studied the action of sodium on orthobrombenzyl-bromide, and obtained anthracene and phenanthrene. The former was identified by its melting point (212°), by the formation of anthraquinone (melting at 273°), and of alizarine; the latter was identified by the melting point of its quinone, 198°, and by Laubenheimer's test. Dibenzyl also forms in this reaction, and an oil of uncertain composition, possibly benzyltoluol.

By this synthesis it is proved that the two connecting carbon atoms in the benzol rings are attached to each ring in the ortho-position, and the last doubt about the constitution of anthracene is removed. (*Chem. News*, XLVI, p. 44.)

Synthesis of Organic Bodies by the Electrolysis of Water and Solutions with Electrodes of Carbon.—A. Bartoli and G. Papasogli, in researches on galvanic polarities, had observed that coke, charcoal, or graphite, under the action of the current, is disaggregated; the electrolyte is blackened more or less, according to its nature and that of the carbon, and the gas evolved at the positive pole is below the normal volume. The authors undertook the present investigation to ascertain what becomes of the oxygen. They experimented with graphite, coke, and wood charcoal, purified by chlorine at high temperatures. With coke or charcoal as positive electrode and distilled water as electrolyte and a battery of 1,200 Daniell cells, they remarked after two days a brown color in the electrolyte and an acid reaction. The battery was then reduced to 100 Bunsen cells, and ten days later to 20 Bunsen cells; these were in operation for 30 days. The water became black; the electrode, which weighed about 500 grams, was totally disaggregated, and a thick muddy deposit was formed. The electrolyte was found to contain mellitic acid and some of its derivatives, such as the hydro-mellitic, pyro-mellitic, and hydro-pyro-mellitic acids.

The muddy deposit contained a black substance soluble in hot water and alkalies, but insoluble in most mineral acids and in the majority of organic solvents. The authors named this body mellogen, since, on oxidation, it yields acids of the benzo-carbonic series. It has the composition $C_{14}H_2O_4$. (*Comptes Rendus*, May 15, 1882.)

Acetoxims.—By the action of acetone on hydroxylamin, Alois Janny has obtained the first member of a new series of bodies, for which series he proposes the name of acetoxims. This name is applied to bodies containing the group $=CNOH$ united on two sides to carbon. When only one bond of the carbon group is united to carbon and the other to hydrogen, derivatives of aldehyde are formed for which the name aldoxims is suggested.

The simplest body of the acetoxims is dinethylacetoxim, having the formula $CH_3—C(NHO)—CH_3$. This is obtained by mixing an aqueous solution of hydroxylamine with acetone and extracting ether, which leaves, on evaporation, brilliant white, hard, volatile, prismatic crystals. It is soluble in water, alcohol, ether, &c., and melts at 59° to 60° C., distilling without decomposition at 134°.8 C. It is a neutral substance, and has a slight odor, resembling chloral.

The author has also prepared and studied ethyl-methylacetoxim, methylpseudobutylacetoxim, and some analogous phenyl derivatives. (*Berichte d. chem. Ges.*, XV, pp. 1324 and 2778.)

Diphenylaminacroleine has been prepared by Prof. Albert R. Leeds by heating an alcoholic solution of diphenylamine with an excess of acroleine. After a few hours' digestion a heavy red precipitate forms, soluble in boiling alcohol, together with a sticky insoluble mass. The latter is treated with alcohol and water until it becomes pulverulent and capable of being powdered in a mortar. This amorphous substance proves to be diphenylaminacroleine $(C_{12}H_{10}N)_2C_3H_4$. It does not fuse nor sublime, but is decomposed, on heating, into a carbonaceous mass. It is insoluble in ether, slightly soluble in alcohol and acetic acid, and soluble in chloroform, yielding a dark red liquid. It could not be obtained in crystals. Bromine converts it into a bromo-compound, also amorphous, and not further examined.

Homoquinine, a new Alkaloid.—Howard and Hodgkin have obtained a new alkaloid from cinchona bark, for which they propose the name *homoquinine*. Its properties are similar to those of quinine, having the same specific rotary power, and nearly the same composition, but it crystallizes from ether more readily, and differs in the solubility of its salts. One part of the sulphate of homoquinine requires more than 100 of water for solution. Alcohol of 90 per cent. dissolves 7.64 parts of the alkaloid, a 5 per cent. solution of which shows a rotation of —158°. (*J. Chem. Soc.*, XLI, p. 66.)

Iodide of Bismuth and Potassium as a Reagent for Alkaloids.—F. Mangini prepares this reagent by mixing 3 parts of iodide of potassium with 16 of iodide of bismuth (liquid) and 3 parts of hydrochloric acid. Thus prepared it is not decomposed by water and gives characteristic phenomena with many alkaloids.

Strychnine, a light-yellow precipitate, limpid solution; after standing the precipitate turns dark yellow. One part of strychnine in 500,000 of water can be detected.

Brucine, a golden-yellow silky precipitate becoming lighter in color.

Morphine, a reddish-yellow precipitate disappearing after some days, when the liquid becomes canary-yellow.

Codeine, a yellowish-red precipitate turning brick-red on standing.

Narceine, a light-yellow precipitate remaining a long time suspended in the liquid; it turns reddish-yellow on standing.

Atropine, a silky precipitate, which settles as a reddish-yellow powder; on standing the precipitate turns canary-yellow and slowly dissolves, coloring the liquid golden yellow.

Aconitine, a flaky precipitate, which settles as a chrome-yellow powder; no change on standing.

Nicotine, a red pulverulent precipitate, becoming reddish-yellow.

Conicine, a red pulverulent precipitate of a more intense color than the preceding, and becoming dirty white on standing.

Solanine, a golden-yellow precipitate forming slowly, and turning darker.

Veratrine, a light-yellow precipitate, turning lighter.

Quinine sulphate, a brick-red precipitate, turning dirty white.

Cinchonine sulphate, like the preceding, but darker after standing. (*Gazzetta Chimica Italiana*, 1882, p. 155, and abstract in *Bull. Soc. Chim.*, XXXVIII, p. 670.)

Application of Electrolysis to Dyeing.—Dr. Frederic Goppelsroeder, of Mühlhausen, has extended the application of electrolysis to the formation of coloring matters and to the art of dyeing. He has employed the galvanic current in producing and simultaneously fixing dyes on various textile fabrics, in preventing the oxidation of colors during the printing, and in preparing solutions of *reduced* dye-stuffs, the so-called blue-vats. To obtain, for example, an aniline black on a fabric or on paper, the stuff is soaked in an aqueous solution of a salt of aniline (the chloride is preferred), and then placed on an unoxidizable metallic plate connected with one pole of a galvanic battery or with a small dynamo machine. A second metallic plate, bearing in relief the design and connected with the other pole, is then placed upon the stuff. By pressing gently and passing the current of electricity a black design is formed. Medals and coins may be copied in a similar manner. By drawing lines on the paper or fabric impregnated with the aniline salt, with a piece of carbon forming one of the poles, or with a non-oxidizable metal, black lines are obtained whenever the presence of the conducting carbon permits the passage of electricity.

Hydrogen generated at the negative pole may be employed instead of zinc, ferrous sulphate, glucose, hydrosulphite, and the other common agents, to reduce baths of indigo, of aniline black, &c. A feeble continuous current gives the best results. The two electrodes must be separated completely. Dr. Goppelsroeder expresses the hope that his experiments may eventually become of industrial importance. (Reprinted from *L' Electricien*, and communicated by the author.)

Method and Apparatus for Testing Inflammable Oils.—In accordance with the instructions of the New York State Board of Health to its sanitary committee, and in response to an order of said committee, Arthur H. Elliott has made an exhaustive report on the methods and apparatus for testing inflammable oils, with special reference to dangerous kerosene. The investigations were made with the ultimate intention of establishing a standard for testing petroleum in New York State. Mr. Elliott examined thirteen kinds of testers, including three open testers, and some electric testers, and experimented with four different samples of oil on each apparatus. His tests show that it is very important to know which apparatus has been used when an oil is said to have a given flashing point. One of the oils showed a range of temperature from 95° to 130° F. The general conclusions to which Mr. Elliott comes are briefly as follows: Of all the 13 apparatuses not one can be called perfectly satisfactory; open testers are entirely untrustworthy for determining the safety of kerosene oil; of the closed testers the Wisconsin State tester, with a few alterations suggested by the author, gives the most reliable results. The electric testers are troublesome to keep in order. (*Second Annual Report of the State Board of Health of New York*, Albany, 1882, p. 449.)

"*Benzol*" *or* "*Benzene*," *a Question in Nomenclature.*—Attention is being directed to the necessity of greater uniformity in nomenclature, especially as regards the important hydrocarbons C_6H_6 and $C_{10}H_8$. German, French, and most American chemists designate $C_6 H_6$ by the name *benzol* (sometimes spelled with a superfluous final *e*), while English chemists use the term *benzene;* in like manner continental chemists name $C_{10}H_8$ *naphthalin*, and Englishmen call it *naphthalene.*

A few years ago the London Chemical Society issued a six-page pamphlet* to its corps of abstractors giving rules of nomenclature and notation, and this has materially aided in securing uniformity. In preparing a paper for the *Berichte der deutschen chemischen Gesellschaft*, on the "Laws of Substitution in the Naphthalene Series," Prof. Henry E. Armstrong, of the London Institution, employed the customary English terms, and desired the publication committee to refrain from changing them. This led to correspondence which is published in the *Berichte* (vol. XV, p.

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* Reprinted in *Chemical News* (1883), vol. XLVII, p. 15.

200). Professor Armstrong objects to the termination *ol* for hydrocarbons not of the paraffin series, and would restrict it to the alcohols—carbinol, phenol, &c. He calls attention to the confusion which results from the terms "ethylene," "anthracene," "phenanthrene," on the one hand, and "benzol," "toluol," and "naphthalin" on the other; and he expresses the hope that the German Chemical Society may unite with the London organization in attempting a uniform nomenclature. The publication committee of the *Berichte* approved of an exchange of views on the question.

American chemists are vitally interested, for in this country the occurrence of the petroleum product called benzine complicates the matter. While the English custom has much in its favor, the similarity in pronunication of "benzine" and "benzene" leads many Americans to follow the continental terminology. Consistency is eminently desirable. It will be interesting to watch the result of the movement.

The *Berichte d. chem. Ges.* for 1882 contains articles on the nomenclature of special groups. We refer to Herrmann on the nomenclature of azo-compounds (p. 813), and to Wallach's paper on the same subject. Liebig's *Annalen* also has a paper, by Aug. Bernthsen, on the nomenclature of derivatives of carbonic acid. (Liebig's *Annalen*, CCXI, p. 85.)

NOTES.

Black phosphorus is formed, according to Maumené, when phosphorus is distilled in hydrogen (made from zinc and sulphuric acid), and not formed when the distillation is conducted in carbonic anhydride. The black color soon disappears.

Lecture experiment.—H. Schwarz finds that zinc dust and sulphur, when intimately mixed, combine with very great energy, and the experiment is more brilliant and interesting than the usual one with iron filings (or copper turnings) and sulphur. The best proportions are two parts by weight of zinc and one of sulphur. The mixture inflames also when struck heavily by a hammer, and when ignited in a confined space (gun-barrel) explodes with about one-fourth the energy of gunpowder.

The rare metal vanadium occurs in large quantity, according to Witz and Osmond, in the residues of the iron furnaces of Creusot, and they describe a process for extracting it on a large scale with a view to its industrial applications.

Solid paraffine has been discovered by Silvestri in basalt. It occurs in cavities about a centimeter in diameter, and is nearly identical with the paraffine occurring in petroleum.

Bernthsen has discussed the unsatisfactory nomenclature of the isomeric sulpho-derivatives of carbonic acid, and proposes to call the radical $=C=S$ *thio-carbonyl*, and to name the acids thio-carbonyl acids. In like manner we may have for $=C=NH$ imido carbonyl and similar derivatives.

Phosphate of chromium, prepared by the action of phosphoric acid and sodium hyposulphite on chromates of the alkalies, forms a fine green pigment, which is proposed by Ad. Carnot as a substitute for the injurious arsenical and cupriferous colors.

Paul Sabatier has published a note claiming priority over A. Colson in the discovery of the *sylphides of silicium*, Si S, and Si SO.

Constantine Fahlberg has patented a process for preparing sulphate of aluminium free of iron for the mineral bauxite. The essential point in the method is the use of lead peroxide for the removal of the iron; the lead compound being afterwards recovered in a very simple manner.

Hautefeuille and Chappuis have studied the formation of pernitric oxide, and assign to it the formula N_2O_6.

Cailletet has obtained a crystalline hydrate of phosphoretted hydrogen by strongly compressing the gas in the presence of water and then suddenly decreasing the pressure. Hydrates of ammonia and of sulphureted hydrogen have also been obtained by this method.

Wroblewski, by a somewhat similar method, has obtained a solid crystalline hydrate of carbonic anhydride, Co_2 $8H_2O$.

In a letter to Nature, G. F. Rodwell revives the controversy concerning the relative claims of Lavoisier and of Priestley to the discovery of oxygen. Rodwell endeavors to give the greater honor to Lavoisier.

Hydroxylamine is found by G. Bertoni and C. Raimondi to be an active poison when injected into the blood. Less than 0.2 gram killed a medium-sized dog. It also exerts a poisonous effect when introduced into the stomach or under the skin. The blood assumes a chocolate color and yields on dialysis nitrous acid, an oxidation product of hydroxylamine.

Two new antiseptics, calcium- and sodium-glycero-borates, have been announced by G. Le Bon, and experiments prove their utility. They are odorless and without injurious action on the most delicate tissues.

azin/ *The discovery of hydr~~ogen~~*, NH_2, claimed by Maumené, has been denied by several chemists who repeated the process (action of potassium permanganate on ammonium oxalate) and obtained negative results.

Bromo-sulphide of carbon has been discovered by Carl Hell and Fr. Urech. It is obtained by the direct action of bromine on carbon disulphide, and forms small brilliant prismatic crystals having the composition $C_2S_3Br_6$.

Rose's fusible alloy has been prepared by W. Spring by subjecting the constituents (lead, bismuth, and tin) in their proper proportion, to enormous pressure. Wood's alloy, melting at 65° C. can be obtained in a similar manner. The pressure employed was 7,500 atmospheres.

Metallic uranium, according to Zimmermann, forms a silver-white, somewhat malleable metal, very hard, but scratched by steel. It has a specific gravity of 18.7. It burns with brilliant light and scintillations, forming a bulky oxide. It is slowly attacked by warm nitric acid and by sulphuric acid, and readily dissolves in hydrochloric.

The Royal Society awarded the Davy medal (in duplicate) to D. Mendelejeff and to Lothar Meyer for their discovery of the periodic relations of the atomic weights. This has drawn out a protest from John A. R. Newlands, of London, who claims priority in the publication of the periodic law, and who produces evidences of his assertion. (*Chem. News*, 46, 278.)

The French Academy of Sciences offer the new Volta prize of 50,000 francs to the author of the discovery which shall enable electricity to be applied economically in one of the following directions: as a source of heat, of light, of chemical action, of mechanical power; as a means of the transmission of intelligence, or of the treatment of disease. Competition is open until June 30, 1887, to scientific men of all nations, and the award will be decided in December, 1887.

The German Chemical Society is in a very flourishing condition. At the close of 1882 it numbered 2,527 members, of whom 16 are honorary and 263 associate members. The *Berichte*, published annually by the society, forms one of the most important of chemical journals; the two volumes issued in 1881 comprise over 3,000 pages, and the volumes for 1882 attain about the same size. The total income of the society for 1882 amounted to 56,247 marks, and the expenses for the same period were 44,697 marks.

Necrology.—During the year 1882 the deaths of many eminent chemists were recorded. Among them may be mentioned: Dr. John W. Draper, of New York; Dr. Henry Draper, of New York; Prof. William B. Rogers, of Boston; Dr. John Stenhouse, of Manchester; Prof. Rudolph Böttger, of Frankfort; Dr. Ludwig Feder, of Munich; Prof. A. Popoff, of Warsaw; Prof. Friedrich Wöhler, of Göttingen.

ERRORS AND CORRECTIONS.

Page 1, 13th line from bottom, *the heading should read* ‘‘PHYSICAL AND INORGANIC CHEMISTRY.”

Page 3, lines 8 and 9, “$H_2O_4Mn_2$” *should be in one line.*

Page 6, line 19 (middle column of table), *for* “Gersdorffita” *read* “Gersdorffite.”

Page 10, line 2, *for* “apotssium” *read* “potassium.”

Page 10, 13th line from bottom, *for* “sluphuric” *read* “sulphuric.”

Page 10, last line, *for* “*Chm.*” *read* “*Chim.*”

Page 12, line 4, *for* “Ca^3, &c.,” *read* “Ca_3, &c.”

Page 12, line 6, *for* “($2CaO_1$” “(2CaO” [*i. e.*, dele $_1$].

Page 15, lines 5 and 6, “$C_{14}H_{14}O_4$” *should be in one line.*

Page 16, line 24, *for* “Curtins” *read* “Curtius.”

Page 18, line 15, *for* “dinethyl-” *read* “dimethyl-.”

Page 22, line 5, *for* “*sylphides*” *read* “*sulphides.*”

Page 22, line 17, *for* “Co_2” *read* “CO_2.”

Page 22, 17th line from bottom, *for* “*hydrogen*” *read* “*hydrazin.*”

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